

Description of *Mesochorispira konincki* (DEWALQUE, 1895), a spiriferid brachiopod from the Belgian Upper Tournaisian

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Abstract

The Upper Tournaisian Belgian species erroneously attributed by de KONINCK (1881, 1883b, 1887) to the Russian species *Spirifer cinctus* KEYSERLING, 1846, was named *S. Konincki* by DEWALQUE (1895). On the basis of examination of the original collection this species is assigned to the genus *Mesochorispira* CARTER, 1992.

Key-words: spiriferids - brachiopods - *Mesochorispira konincki* n. sp. - Upper Tournaisian - Belgium.

Résumé

L'espèce belge du Tournaisien Supérieur, erronément attribuée par de KONINCK (1881, 1883b, 1887) à l'espèce russe *Spirifer cinctus* KEYSERLING, 1846, fut nommée *S. Konincki* par DEWALQUE (1895). Sur base de l'étude de la collection originale cette espèce est placée dans le genre *Mesochorispira* CARTER, 1992.

Mots-clefs: Spiriférides - Brachiopodes - *Mesochorispira konincki* - Tournaisien Supérieur - Belgique.

Introduction

Before proceeding to the description of various Tournaisian spiriferids the present authors wish first to clarify a very muddled field. This task involves the revision of some key species frequently mentioned in both the Belgian and world literature. *Spirifer Tornacensis* de KONINCK, 1883b, established in the type area of the Tournaisian and named after it, was the obvious first species for investigation. This has been done, and the species was assigned to the new genus *Atylephorus* by SARTENAER & PLODOWSKI, 1996. Previously, the Belgian species *Spirifer tornacensis* was somewhat precipitately recognized as occurring in many parts of the world; conversely the presence of species established in other countries was also too quickly recognized in Belgium. This is the case with

the Russian species *Spirifer Sowerbyi* (FISCHER de WALDHEIM, 1825) (originally *Choristites Sowerbyi*), *S. Mosquensis* (FISCHER de WALDHEIM, 1825) (originally *Choristites Mosquensis*), and *S. cinctus* KEYSERLING, 1846, the last being from the Pechora Basin, the other two from the Moscow Basin. The ages of these three species in their type areas are, in modern terms, respectively late Moscovian, latest Moscovian and latest Tournaisian. de KONINCK (1842-1844, pp. 252-253, pl. XVI, figs. 1a-c) amalgamated the three species *Choristites Mosquensis*, *C. Sowerbyi* and *C. Kleinii* erected by FISCHER de WALDHEIM (1825) under the name *Spirifer Sowerbyi*, the first mentioned in that original publication. de KONINCK recognized occurrences of this species *Spirifer Sowerbyi* in the Belgian Tournaisian at various localities ("Tournay, Ath, Soignies, Feluy, Écaussinnes, Comblain au Pont, Chanxhe"). On the other hand, de VERNEUIL (*in* MURCHISON, de VERNEUIL & de KEYSERLING, 1845, pp. 161-163) considered *Choristites Sowerbyi* as a mere variety of *S. Mosquensis*, present in both Russia and Belgium. de KONINCK (1847, pp. 135, 232) accepted de VERNEUIL's interpretation, expressed as "*Spirifer Sowerbyi* (*mosquensis*) FISCHER" [or "*Spirifer Sowerbyi* (*Mosquensis*) FISCHER"]. In so doing he perpetuated de VERNEUIL's double mistake: the amalgamation of *S. mosquensis* and *S. Sowerbyi*, and the presence of *S. mosquensis* in both countries. de KONINCK (1847) accepted the presence of *S. mosquensis* (or *S. Mosquensis*) in the Belgian Tournaisian ("assises inférieures du calcaire carbonifère") until he decided (1881, p. 56, footnote 1; 1883a, p. 253, footnote 1; 1883b, pp. 373, 379, 381, 385, 387, 388) to substitute for it two species: *S. tornacensis* (or *S. Tornacensis*) and *S. cinctus*. In 1883b he added to these the new Belgian species *S. subcinctus*. The identification in Belgium of *S. cinctus* was no more correct than the two previous attempts, and DEWALQUE (1893, p. LXXIV; 1895, p. XLVI) very aptly wrote: "le *Spirifer* que nous avons connu pendant quarante ans sous le nom de *S. Mosquensis* et auquel le nom de *S. cinctus* ne peut être conservé", and "*S. cinctus*, De Kon., qui n'est pas du tout l'espèce du comte de Keyserling." DEWALQUE was referring to specimens of *S. cinctus* mentioned by de KONINCK (1881, p. 56) and subsequently described by that author (1883b, pp. 381,

383-386, pl. XV, figs. 3-8; 1887, pp. 108-109, pl. XXIV, figs. 6, 7, pl. XXVI, figs. 1-4). Consequently he proposed in 1895 (pp. XLVI-XLVII) the name *S. Konincki* as a substitute for *Spirifer cinctus sensu de KONINCK*, 1883b (*non* KEYSERLING, 1846). The reference to de KONINCK (1883b, 1887) being an indication according to Article 12.2 of the IRZN, *S. Konincki* is a valid species. Furthermore it is clear that DEWALQUE's intention (1893, p. LXXIV; 1895, pp. XLVI-XLVII) was to name as *S. Konincki* "toutes ces formes" characterizing the "Petit-granit" (Tn3b) of both the Ourthe valley (eastern border of the Dinant Basin) and the Hainault Province.

S. Konincki received wide acceptance and expressions such as *S. konincki* DEW. (= *S. cinctus* de KON.) flourished in the literature (e.g. de DORLODOT, 1909, p. 159; DELATRE *et al.*, 1973, p. 95; DEHÉE, 1929, p. 22; LIPINA, 1965, tab., p. 156, p. 158; LISITZYN, 1929, tab., p. 8, p. 31, p. 88, tab., p. 105, table in pocket); LOMBARD, 1957, tab., pp. 262-263; MORTELMANS & BOURGUIGNON, 1954, tab., p. 226, pp. 247, 248; MOURLON, 1908, pp. 91, 99, 101, 103; VAN SCHEPDAEL, 1964, p. 356; VAUGHAN, 1911, table between p. 108 and p. 109).

In 1976 (p. 109) BUBLICHENKO designated as the lectotype of *S. Konincki* DEWALQUE, 1895 the specimen figured by de KONINCK (1842) on plate XIV, figures 1a-c (as *S. Sowerbyi* FISCHER). In order to give a complete account we must remember that DEMANET (1923, p. 167, foot-note 3) wrote that, if the name *cinctus*, i.e. the *Spirifer cinctus* described and figured by de KONINCK (1883b, pp. 383-386, pl. XV, figs. 3-8; 1887, pp. 108-109, pl. XXIV, figs. 6, 7, pl. XXVI, figs. 1-4), not *S. cinctus* KEYSERLING, 1846, had to be replaced by another name, then *S. subcinctus* de KONINCK, 1883b that DEWALQUE (1895, p. XLVI) considered as a form "not separable from *S. cinctus*", has to be that name. DEMANET also referred to LOHEST and FORIR, who had already raised the point, but he did not give the reference to this publication, and the present authors are not aware of it. However, as explained below, *S. subcinctus* is different from the *S. cinctus* figured by de KONINCK (1883b, 1887).

In 1909 (pp. 551, 558, 561, 574-576, pl. XXVI, figs. 1a, b) DOUGLAS mentioned *S. konincki* (see Plate 5, Figs. 34-38) from the *Syringothyris*-Zone (considered provisionally as equivalent to the Waulsortian Phase of Belgium)) of Cratloe, East Clare County, Ireland. DOUGLAS seems to have been unaware of DEWALQUE's publication, which is mentioned nowhere in his paper, although *Spirifer Konincki* DEWALQUE was commonly cited in the literature between 1895 and 1909 [e.g. de DORLODOT (1895, p. 253; 1909, p. 159), CORNET (1903, p. 150, p. 152), VAUGHAN (1905, p. 256), MOURLON (1908, p. 91, p. 99, p. 101, p. 103), DELÉPINE (1910, p. 128)].

The Irish species *S. konincki* having little in common with the Belgian *Spirifer Konincki*, the replacement name *Palaeochoristites douglasi* nom. n. was proposed by BUBLICHENKO (1976, p. 108, p. 109), who also designated a lectotype.

As far as the taxonomically unacceptable expression *Spirifer Konincki* DEWALQUE *vel* DOUGLAS used by DEMA-

NET (1923, p. 166, p. 168, p. 169, p. 170) is concerned, it results from the perceived conspecificity of the Irish species and the Belgian forms accepted by that author (p. 168).

Description of *Mesochorispira konincki* (DEWALQUE, 1895)

Family Spiriferidae KING 1846
Subfamily Spiriferinae KING 1846
Genus *Mesochorispira* CARTER 1992
Type species: *Spirifer grimesi* HALL 1858

Mesochorispira konincki (DEWALQUE, 1895)

Plate 1, Figures 1-7; Plate 2, Figures 8-14;
Plate 3, Figures 15-21; Plate 4, Figures 22-25;
Plate 5, Figures 31-33; Text-Figures 1-4

Remarks

The subgenus *Spirifer* (*Mesochorispira*) CARTER 1992 is here treated as a distinct genus, in agreement with POLETAEV (1999, p. 44), who also assigned (p. 44, fig. 3B, p. 45) the Belgian species to that genus.

It is interesting to note that de KONINCK (1883b, p. 383; 1887, p. 108) included *S. Grimesii* from Burlington, Iowa (and other localities in Illinois and Ohio) in the synonymy of what he erroneously called *Spirifer cinctus*. Conversely, more than one century later when CARTER (1992, p. 327, p. 334, pp. 335, 337) established the subgenus *S. (Mesochorispira)*, with *S. grimesi* as its type species, he considered among the possible members of the subgenus the "Belgian Upper Tournaisian species Koninck (1887) incorrectly referred to *Spirifer cinctus* Keyserling 1846 (plate 24, fig. 6,7; plate 26, fig. 1-4)". Some characters included in the following description were already mentioned by de KONINCK (1883b, pp. 383-385; 1887, pp. 108-109) in his extensive descriptions of "*Spirifer cinctus*".

SYNONYMY

As explained above, *Mesochorispira konincki* encompasses the forms that were successively identified as *S. Sowerbyi*, *S. Mosquensis*, *S. cinctus*, and *S. Konincki* in Belgium.

DIAGNOSTIC FEATURES

Large to very large *Mesochorispira*; globose with rounded to slightly transverse outline; cardinal extremities rounded, rarely slightly mucronate; hinge line always shorter than greatest width of shell; ventribiconvex the pedicle valve being markedly deeper than the brachial valve; sulcus and fold weakly to moderately developed, indistinctly defined, costate; ornament consisting of weak and flattened costae separated by narrow grooves; lateral costae numerous (> 20 to 35), often bifurcating, sometimes trifurcating; some costae may bifurcate two or three times; sulcus with a median costa bifurcating once or twice, 8-12 lateral costae on each side of the sulcus bifurcating or trifurcating from bounding costa; micro-ornament reticulate, consisting of fine growth lines and capillae; irregularly spaced growth varices more numer-

ous near the anterior commissure; pedicle valve interior with stout, diverging dental plates and adminicula, short delthyrial plate and thick apical callosity; brachial valve with short crural plates completely buried in apical callus.

TYPES

I.R.Sc.N.B. = Royal Belgian Institute of Natural Sciences, Brussels.

Lectotype designated by BUBLICHENKO [1976, p. 109: by reference to pl. XIV, figs. 1a-c (as *Spirifer Sowerbyi* FISCHER) in de KONINCK, 1842]. These figures cannot be referred to a given specimen because, in contrast with later precise drawings by de KONINCK, those of 1842 are schematic. The long hinge line, the deep and well-defined sulcus, the high tongue, the well-defined fold, and the simple and wide lateral costae are characters not to be found in any single specimen in de KONINCK's collection. According to de KONINCK (1842, p. ij) this diagrammatic representation was his own, and probably the result of observations made on more than one specimen: "nous avons fait figurer toutes les espèces que nous avons décrites et nous nous sommes efforcés de rendre les figures aussi exactes que possible. Dans ce but, nous avons dessiné nous-même au trait la plupart de ces espèces. Comme il n'est pas toujours possible de se procurer des échantillons parfaits, nous ne nous sommes permis de restaurer les fragments, que lorsque nous en avons en notre possession un assez grand nombre pour pouvoir facilement compléter les uns par les autres". This diagrammatic representation was not duplicated when de KONINCK (1883b, 1887) published, under the name of *S. cinctus*, good lithographs of easily recognizable specimens of the same Belgian species. This is the reason why the present authors decided it was not essential to designate a neotype. The abundance of the specimens, as well as the possibility that the lectotype could be a temporarily misplaced actual specimen, supports that decision.

Hypotype (Autohyle), old number: AV6294, new number: I.R.Sc.N.B. a4289. Pl. 1, Figs. 1-7; Pl. 3, Figs. 17, 19, 21; Text-Fig. 2c = Pl. XV, figs. 3-6 in de KONINCK, 1883b as *Spirifer cinctus*, A. de Keyserling from the "calcaire carbonifère (étage I)", Tournaisian, actually "Petit-granit" (Tn3b = middle part of Upper Tournaisian). Complete specimen from Soignies (Hainault).

Hypotype (Autohyle), old number: AV6044, new number: I.R.Sc.N.B. a4290. Pl. 2, Figs. 8-13; Pl. 3, Figs. 16, 18, 20; Text-Fig. 2b = Pl. XV, fig. 7 in de KONINCK, 1883b as *Spirifer cinctus*, A. de Keyserling = Pl. XXVI, figs. 1-3 in de KONINCK, 1887 as *S. cinctus*, A. de Keyserling. Same locality and formation. Complete specimen, but part of the anterior half of the brachial valve is crushed [Remark: de KONINCK in 1883b gave Soignies as the locality, and in 1887 Comblain-au-Pont (Ourthe valley on the eastern border of the Dinant Basin, Province of Liège). Soignies is here favoured, because the external preservation of the specimen corresponds to other specimens coming from that locality]

Hypotype (Autohyle), old number: AV6045, new number: I.R.Sc.N.B. a5578. Pl. 4, Figs. 22-25; Pl. 5, Figs. 31-

33; Fig. 2a = Pl. XXIV, figs. 6, 7 in de KONINCK, 1887 as *S. cinctus*, A. de Keyserling from the "calcaire de Soignies, étage I", Tournaisian. Particularly large and nearly complete specimen. [Remark: according to the labels accompanying the specimen, three localities (all of them immediately south of Dinant) are mentioned: Anseremme, Furfooz, les Pauquys. The Upper Tournaisian Waulsortian reef-facies is developed in this area of the central part of the Dinant Basin].

Doubtful *hypotype*, old number: AV6046; new number: I.R.Sc.N.B. a4291. Pl. 2, Fig. 14; Pl. 3, Fig. 15 = Pl. XV, fig. 8 in de KONINCK, 1883b as *S. cinctus*, A. de Keyserling = Pl. XXVI, fig. 4 in de KONINCK, 1887 as *S. cinctus*, A. de Keyserling from the "calschiste de Tournai", Upper Tournaisian. The present authors do not believe that this fragmental pedicle valve showing the interior belongs to *Mesochorispira konincki*; they are inclined to assign it to *Athyrophorus tornacensis* (de KONINCK, 1883b).

Hypotype, I.R.Sc.N.B. a11262. Figs. 3, 4. Tn3b. Neufvilles-lez-Soignies (Carrières du Clypot).

LOCUS TYPICUS

Soignies (Hainault), Belgium.

STRATUM TYPICUM

"Petit-granit" = Tn3b = middle part of Upper Tournaisian.

DESCRIPTION

General external characters

Adult shells large to very large, globose, with rounded to transversely oval outline; outline of shell undergoes a threefold change during ontogeny: from rounded with a brachythyrid hinge line and rounded cardinal extremities in juveniles to slightly transverse with a megathyrid hinge line and short mucronations at mid size, and finally back to rounded with a brachythyrid hinge line and rounded cardinal extremities ($lc/w = 0,74 - 0,9$). The greatest width equals or slightly exceeds the length of the pedicle valve ($lpv/w = 1,02 - 0,76$). Shell ventribiconvex with the pedicle valve distinctly deeper than the brachial valve. Flanks of the pedicle valve very convex in cardinal view, sloping steeply to the lateral margin; flanks of brachial valve only very slightly convex, sloping evenly in a nearly straight line to the lateral margin.

Sulcus originating at the beak, shallow to moderately deep throughout its length, sometimes vestigial, with rounded bottom; its maximum width at the front margin equals $\pm 1/3$ of shell width. Sulcus vaguely delimited over its entire length, passing imperceptibly to the flanks; bounding costae of sulcus not differing from others; low and rounded tongue. Ventral beak sharp, low, moderately inflated, strongly incurved, and overhanging the ventral interarea, sometimes nearly touching the inconspicuous dorsal beak, shoulders slightly concave. Low ventral interarea, generally triangular, rarely with subparallel borders, apsacline, weakly concave with the exception of the

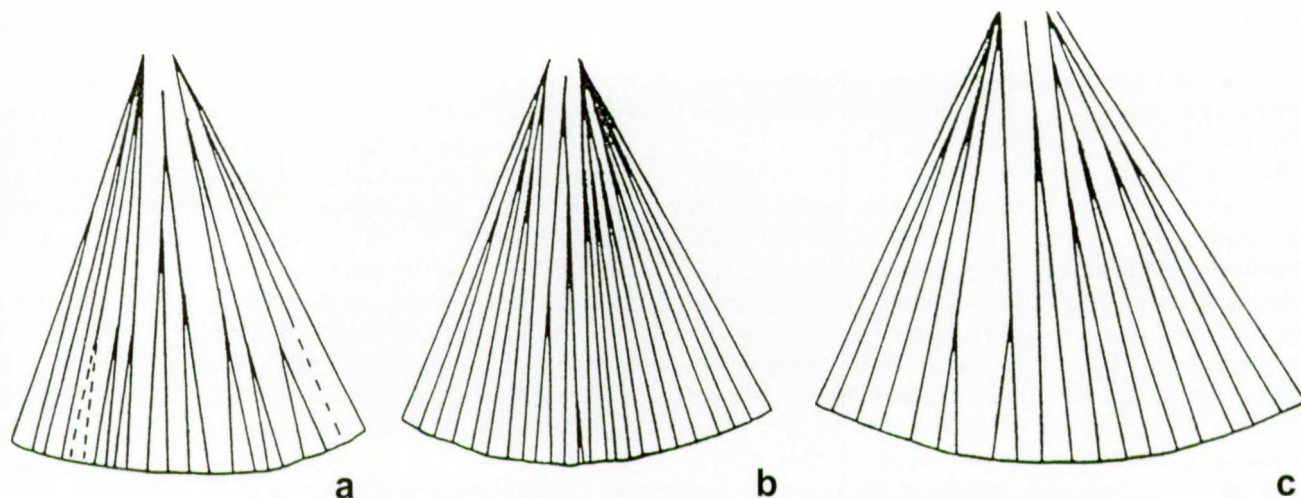


Fig. 1 — *Mesochorispira konincki* (DEWALQUE, 1895). Costation on sulcus. a: hypotype (autohyle), I.R.Sc.N.B. a5578 (old number: AV6045); b: hypotype (autohyle), I.R.Sc.N.B. a4290 (old number: AV6044); c: hypotype (autohyle), I.R.Sc.N.B. a4289 (old number: AV6294).

strongly incurved juvenile part. Interarea separated from flanks by distinct borders. Large delthyrium, wider than high, with apical angle of about 80° ; no delthyrial cover observed. Ornament of interarea consists of growth lines parallel to hinge line, and irregularly sinuous growth traces of denticles perpendicular to them. Denticulate hinge line.

Fold indistinctly delimited for its entire length, posterior half slightly raised above flanks, near anterior border generally moderately high, may be very high. Dorsal beak small, only slightly inflated, strongly incurved, overhanging the dorsal interarea, which is very low, triangular, and anacline. Very wide, low, open notothyrium.

Nr.	w	lpv	lpvu	lbv	lbvu	t	lc	lc/w	lpv/w
4289 (AV6294)	88,5	73,5	117,5	63,3	75,0	49,0	69,0	0,78	0,83
4290 (AV6044)	94,5	86,0	128,0	76,5	(90,0)	58,5	72,0	0,76	0,91
5578 (AV6045)	107,0*	81,7	(~125,0)	71,7	(93,0)	59,0	---	---	0,76
6276	105,4	80,3	119,0	---	---	35,0 (pv)	~79,0	~0,75	0,76
6277	68,7	68,0	109,0	---	---	27,5 (pv)	56,0	0,82	0,99
6278	101,5	79,0	106,5	---	---	21,5 (pv)	92,0	0,90	0,78
6279	83,5	74,0	102,5	---	---	25,0 (pv)	~62,0	~0,74	0,89
6280	88,0	71,5	104,0	---	---	20,5 (pv)	~70,0	~0,80	0,81
6281	81,7	82,0	110,5	---	---	21,5 (pv)	~76,0	~0,93	1,00
6282	77,5	70,5	108,0	---	---	27,0 (pv)	~58,0	~0,75	0,91
6283	76,0	66,4	99,5	---	---	24,5 (pv)	~60,0	~0,79	0,87
6284	76,2	68,0	108,0	60,6	---	55,5	67,0	0,75	0,89
6286	74,8	76,2	~113,0	67,0	---	49,5	~60,0	~0,80	1,02
								0,80	0,88

* 2 x left half in ventral view

Fig. 2 — Measurements (in mm) of some specimens of *Mesochorispira konincki* (DEWALQUE, 1895). Abbreviations used: w = width; lpv = length of pedicle valve; lpvu = unrolled length of pedicle valve; lbv = length of brachial valve; lbvu = unrolled length of brachial valve; t = thickness; lc = length of cardinal margin.

Ornament

Weak costae becoming obsolete near the cardinal extremities, remarkably flat, separated by narrow grooves. Bifurcations or even trifurcations common, the resulting costae tending to form indistinct bundles on part of their way to the border, thus giving a somewhat irregular aspect to the ribbing pattern. Location of bifurcations and trifurcations irregularly distributed but most frequent near the beak; resulting costae may bifurcate again, especially those on inner half of flanks. Width of costae near anterior border varies according to number and location of bifurcations and trifurcations (5-7 per 10 mm).

Number of lateral costae highly variable (>20 to 35 on each flank), generally different on both flanks because number and position of bifurcations and trifurcations may differ considerably from one flank to the other.

Costae in sulcus and on fold numerous, generally 20-25. Sulcus always with a median costa which may bifurcate once, twice or very rarely three times, thus resulting in 2-5 costae having originated from the median one. The lateral costae in the sulcus originate from its bounding costae. The sulcus bounding costae trifurcate at the very apex; the resulting costae may bifurcate once or twice or even (very rarely) trifurcate. As the bifurcations of the lateral costae are highly irregular there may be 8-12 lateral costae differently ordered on each side of the sulcus. This renders the costation pattern somewhat asymmetrical. The costation of the fold begins with a median costa and one pair of lateral costae, all of which bifurcate twice to three times; rare trifurcations may occur.

Micro-ornament consists of closely spaced growth lines and radial capillae, forming a reticulate pattern. Irregularly spaced growth varices occur but are not imbricate.

Dimensions

Unrolled length of the pedicle valve is by far the largest dimension, but its length (distance between ventral beak and anterior border (lpv) is equal to or less than the maximum width. Maximum convexity of pedicle valve at mid-length, and of brachial valve in posterior third of valve. Measurements are shown on Figure 2.

Internal characters (see Figures 3,4)

In adult specimens posterior part of pedicle valve considerably thickened by secondary shell material, completely or nearly completely closing the lateral apical cavities. Delthyrial cavity with much less callosity; thus, the inner walls of the short, stout dental plates and adminicula are free, whereas the outer walls are embedded in apical callosity. Both dental plates and adminicula are moderately divergent anteriorly, the adminicula delimiting the posterior part of the subrhombic ventral muscle field. Very short delthyrial plate, almost completely embedded in callosity. Muscle field impressed posteriorly, at or slightly raised above the level of the shell floor anteriorly. Adjustor field remarkably large, triangular and smooth, situated on a slightly to distinctly raised platform; adductor scars long and very narrow, partly divided by a myophragm, laterally enclosed by diductor scars

which are ornamented with irregular and often branching ridges; in their posterior third the ridges are postero-laterally oriented, while they have an antero-lateral direction in their anterior part; they are crossed by straight, radially directed ridges. Muscle field surrounded by broad area with ovarian pits; radially arranged pallial markings are also observed.

Interior of brachial valve with a bifid lamellose cardinal process fused to the posterior parts of the brachio-phores. In some polished sections structures reminiscent of crural plates may be observed, but a careful examination reveals that these structures are composed of two discrete elements: the crural bases and the fold-bounding grooves. Dorsal muscle field large, elongate, delimited by a low ridge, and surrounded by a broad area with ovarian pits like in the pedicle valve. Other characters unknown.

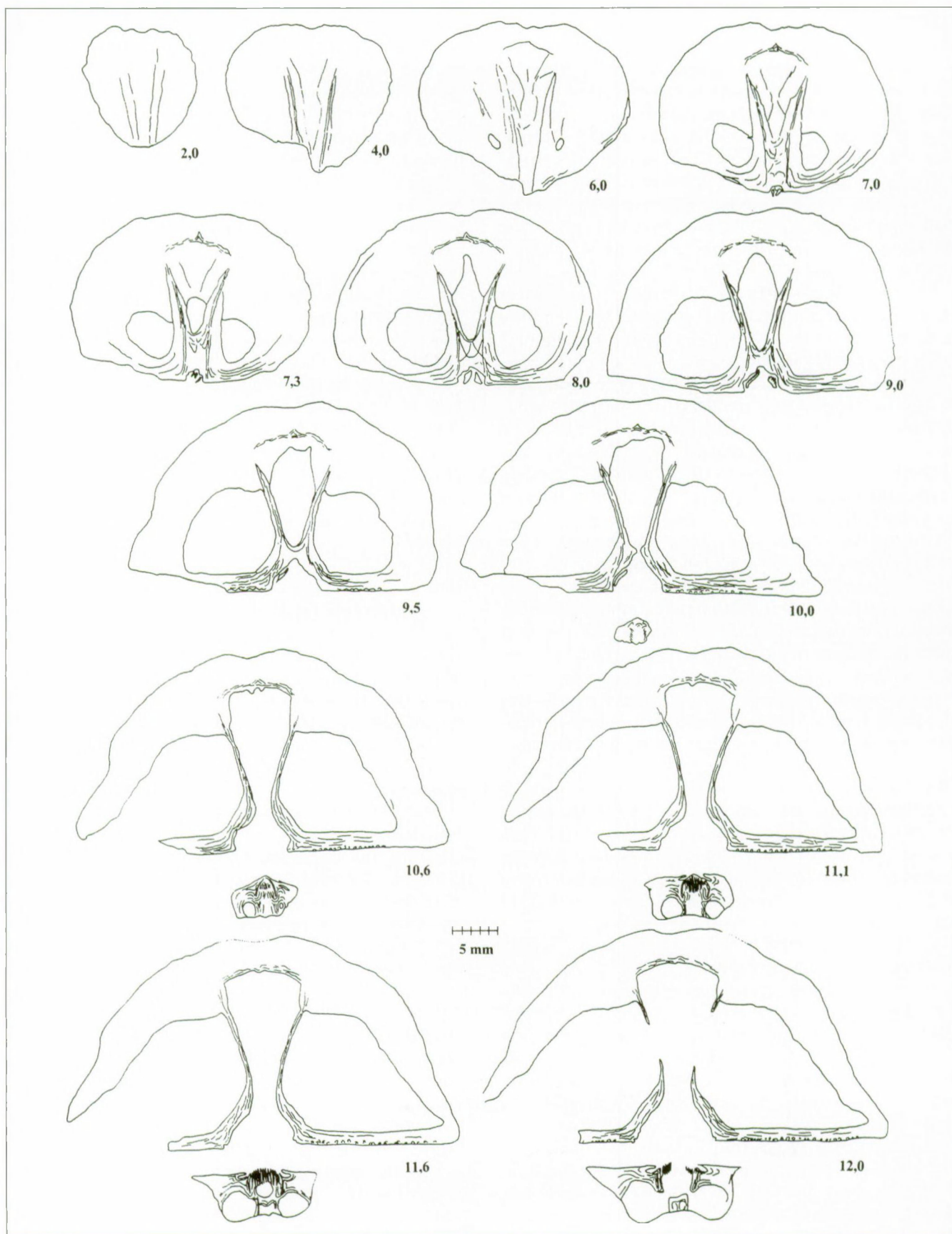
A polished section of a specimen from Comblain-au-Pont in the Ourthe valley was figured by SOKOLSKAYA (1941, pl. IX, fig. 6) as *Spirifer cinctus* Kon. Some serial transverse sections of another Belgian specimen were illustrated by POLETAEV (1999, fig. 3B, p. 45); this specimen collected by Th.N.Chernyshev came from the "Upper Tournaisian, zone Tn3c" of Ligny [near Fleurus].

DISCUSSION AND COMPARISONS

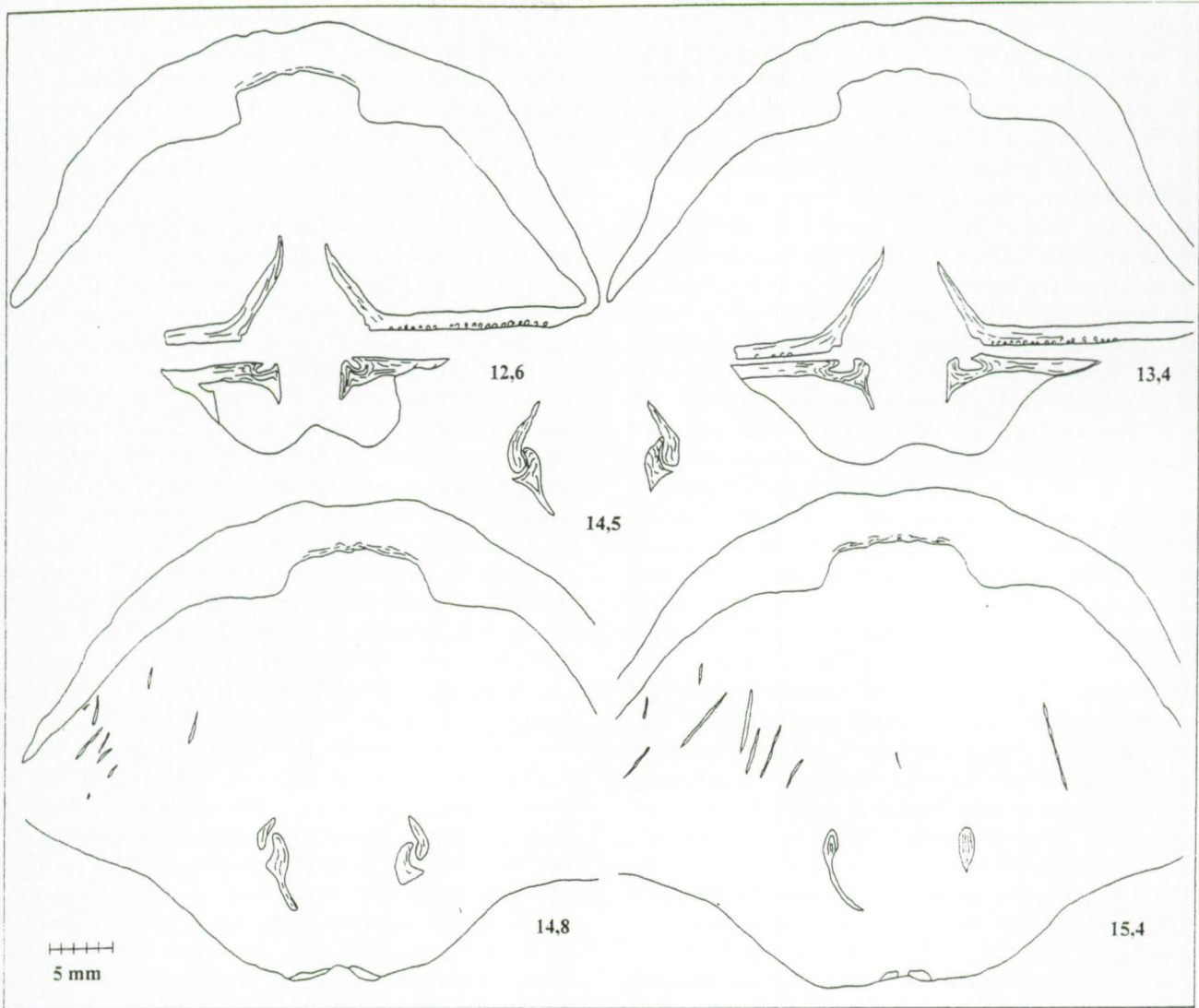
The *stratum typicum* and the *locus typicus* of *Mesochorispira grimesi* are the Burlington Limestone of early Osage age [correlative of the Upper Tournaisian (Tn3)] of Burlington (Iowa, USA). Among its five figured syntypes, two are casts of pedicle valves, one is an isolated pedicle valve, one is a complete specimen, and one is half (posterior part) a specimen. The last three specimens have a shorter hinge line than *M. konincki*, but HALL (1858, plate explanation) noted that the "hinge-line in both casts is proportionally more extended than in the specimen fig. 1a,b [= the complete specimen]". The complete specimen and the isolated pedicle valve show that *M. grimesi* is elongated, contrary to *M. konincki*. Specimens of *M. grimesi* from outside the type area, e.g. those from the Burlington Limestone of Springfield, (Missouri, USA), figured by WELLER (1914, pl. LI, figs. 1,2; pl. LII, figs. 1-4) or those from the St. Joe Formation near Kenwood (Oklahoma, USA), figured by CARTER (1992, p. 336, figs. 5.1-5.5; 1999, p. 128, figs. 17A-D) are transversely elongated. On account of this discrepancy, it seems necessary for further discussion to select a lectotype, i.e. the specimen of plate XIV, figures 1a,b in HALL (in HALL & WHITNEY, 1858). A constant difference between *M. grimesi* and *M. konincki* is the somewhat deeper sulcus and higher fold of the American species.

The late Moscovian *Choristites Sowerbyi* FISCHER de WALDHEIM, 1825 displays only superficial resemblances to *Mesochorispira konincki* in its overall shape. The very different dimensions and the long subparallel dental plates and adminicula make closer comparison unnecessary.

Spirifer konincki sensu DOUGLAS, 1909 (original identification; certainly not assignable to *Spirifer*), of which the lectotype (see Pl. 5, Figs. 34-38) was designated by



Figs. 3, 4 — *Mesochorispira konincki* (DEWALQUE, 1895). Hypotype (Autohyle), I.R.Sc.N.B. a1262 camera lucida drawings of serial transverse section in the apical region of the pedicle valve; figures are distances in mm forward of the ventral umbo. Section at the bottom of Fig. 4 is an enlargement of the dorsal part of section 11.1 of Fig. 3: it shows that what looks like crural plates is actually made of the crural bases and the fold-bounding grooves.



BUBLICHENKO (1976, p. 108), differs from *Mesochorispira konincki* in: a smaller size; a more distinct and rather well defined sulcus with either a flat bottom or a median fold (in lectotype); a long tongue; a high fold with strong bounding grooves in its posterior part; and a flat brachial valve becoming concave towards the lateral and antero-lateral borders; rounded costae; and wider grooves.

DEMANET (1923, p. 92, p. 94, pp. 168-171, tables A,B, pl. VIII, figs. 59a,b, 60a,b, 61) described three varieties of *Spirifer konincki* based on specimens coming from the Waulsortian (Upper Tournaisian) reef-facies of the Four à Chaux quarries in Maredsous, each of them illustrated by a single specimen. The variety described as *S. konincki* DEW. vel DOUGL. var. *attenuiformis* nov. var. or *S. konincki* DOUGLAS var. *attenuiformis* nov. var., although having a well defined and lower fold, and a smaller size, seems to be just a juvenile form of *Mesochorispira konincki*, of which it has the outline and the costation pattern. This was also the conclusion reached by BUBLICHENKO (1976, p. 109), who put both *Spirifer Konincki* and this variety into the synonymy of what he called *Palaeochoristites konincki* (DEWALQUE, 1895). The variety described as *Spirifer konincki* DEW. vel DOUGL. var. *latissimus* nov. var. or *S. konincki* DOUGLAS var. *latissimus* var. nov., of which the figured specimen is strongly deformed, differs considerably from *Mesochorispira konincki* by its extremely transverse outline and its costation pattern. The variety described as *S. konincki* DEWALQUE vel DOUGLAS var. *princeps* MCCOY?, or *S. konincki* DOUGLAS var. *princeps* MCCOY?, or *S. konincki* DOUGLAS var. *princeps* MCCOY, has a rounded-triangular outline and a costation reminiscent of the specimen of *S. subcinctus* figured by de KONINCK (1887, pl. XXVI, figs. 9-11).

Palaeochoristites cinctus (KEYSERLING, 1846) from the Sopless valley is the type species of the genus *Palaeochoristites* SOKOLSKAYA, 1941. [The Sopless is a tributary of the Pechora in the Timan-Pechora (Komi, Russian Federation)]. The *stratum typicum* of the species is the uppermost part of the Kizel horizon of late Tournaisian age [highest Tn3b + Tn3c (but not its highest part)]. Because the original specimen of *Spirifer cinctus* figured by KEYSERLING (1846) was missing in the collection "Reise in das Petschora-Land" housed in the Mining Institute in Saint Petersburg, SOKOLSKAYA (1941, p. 33) examined topotypes collected by T.A. Dobrolyubova, and considered them as having a "complete analogy" with the specimens (see Pl. 4, Figs. 26-30) from the Chernyshino Limestone of the Moscow Basin; these limestones represent the upper subhorizon (corresponding to Tn3a) of the Cherepet' horizon. The present authors do not share this opinion, because important differences, e.g. in costation (in the Pechora specimens costae are more numerous, narrower, and divisions are more common), can be observed between specimens coming from the two regions. The rejection by DEWALQUE (1893, p. LXXIV; 1895, p. XLVI) (see above) of the presence of this species in the Tournaisian of Belgium was never questioned. Compared to *Mesochorispira konincki*, *Palaeochoristites cinctus* is smaller, transversely elongate, and has neither

fold nor sulcus so that the anterior commissure is rectimarginate, in contrast to the uniplicate commissure of *Mesochorispira konincki*. Costation is comparatively stronger with rounded costae and fewer bifurcations. *P. cinctus* differs internally by the presence of long dorsal adminicula in the brachial valve, and subparallel dental plates in the pedicle valve.

Spirifer subcinctus de KONINCK, 1883b (original identification; certainly not assignable to *Spirifer*) from the Waulsortian reef-facies of late Tournaisian age of the central part of the Dinant Basin was considered by DEWALQUE (1895, p. XLVI), as well as by DELÉPINE (1910, p. 12, p. 17), as conspecific with *S. cinctus sensu* de KONINCK, 1883b, and by DEMANET (1958, p. 80) as a variety of *S. konincki*. This amalgamation resulted partly from the acceptance of a wide variability for a single taxon lumping together two loosely interpreted taxa. Such a concept was supported by the illustrations in de KONINCK (1887, pl. XXIV, figs. 4,5; pl. XXVI, figs. 9-11) of two specimens of *S. subcinctus* (one of them already figured by de KONINCK, 1883b, pl. XV, figs. 9, 10) differing by some characters, including size, thickness, and costation. It seems therefore necessary to formally select a lectotype, designating as such the specimen figured by de KONINCK (1883b). The following differences between *Mesochorispira konincki* and *Spirifer subcinctus*, considered by CARTER (1992, p. 335) as a "possible member" of *Mesochorispira*, are based on this lectotype. *Spirifer subcinctus* is smaller, thinner, and rounded triangular in outline; the hinge line is mucronate and corresponds to the maximum width (the slender alae are often broken off, thus giving the appearance of a brachythyrid hinge line); sulcus and (especially) fold, are more clearly defined; costae are rounded in cross-section; lateral costae resulting from bifurcations or trifurcations tend to become fasciculate, a usual characteristic in the Viséan *striatus*-group.

Spirifer subgrandis BEZNOSOVA, 1959 from the uppermost Tournaisian Fominskoye horizon of the Kuznetsk Basin is very similar to *Mesochorispira konincki*. It differs by its more transverse outline, the presence of mucronations even in gerontic stages, and costae which are low but not flattened.

Spirifer subgrandiformis PLODOWSKI, 1968 from the Upper Viséan of central Afghanistan is mucronate, more transverse, and much flatter than *Mesochorispira konincki*, and has a simple costation pattern with few bifurcations and no trifurcations.

GEOGRAPHICAL LOCATION AND STRATIGRAPHICAL POSITION
Mesochorispira konincki is an abundant and typical species of the "Petit-granit" facies of Tn3b (middle part of the Upper Tournaisian) age. Some specimens in the collections of the Royal Belgian Institute of Natural Sciences derive, according to the labels, from the "Le Rache" horizon (Tn3c) of the Clypot quarries. While this horizon is normally slightly alternated and decalcified, the matrix of the specimens show a typical "Petit-granit" aspect. Therefore, although not highly probable, a Tn3c age cannot be excluded for the species.

M. konincki is found in the following Belgian localities:

- northern border of the Namur Basin (type area of the “Petit-granit”): Chièvres, Écaussinnes (Carrière du Levant), Féluy, Fleurus, Maffle (Carrières et Fours à Chaux de la Dendre), Mévergnies, Neufvilles-lez-Soignies (Carrières du Clypot), Soignies (Carrières du Hainaut, du Perlonjour, du Nouveau Monde);
- southern border of the Namur Basin: Huy;
- central part of the Dinant Basin: Hastière, Maredsous (Carrières du Four à Chaux), Natoye, Yvoir;
- eastern border of the Dinant Basin: Anthisnes (Carrière Merbes-Sprimont), Chanxhe, Comblain-au-Pont, Esneux, Hamoir, Nandrin, Tavier.

M. konincki probably evolved from the Middle Tournaisian *Spirifer suavis* group.

According to DEWALQUE (1895, p. XLVII), and other authors, e.g. DELÉPINE (1921, p. 20; 1922, p. 20), *Mesochorispira konincki* characterized the “Petit-granit” (Tn3b).

Although restricting the *S. Konincki* Zone to the Upper Tournaisian, DELÉPINE (1922, table, p. 611; 1928, table, p. 226; 1930, p. 536) wrote (1928, p. 227) that *S. Konincki* appears at the very base of Z1 [Lower Tournaisian] and can still be found in C2 [Lower Viséan], although it reaches beyond all question its maximum frequency and

size in C1 [Upper Tournaisian]. CORNET (1927, p. 459) also accepted that the “large petit-granit (T2b) spiriferid, *S. Konincki*...reappeared higher in a petit-granit facies of the Viséan”. The Assise de Celles with *S. Konincki* of MAILLIEUX & DEMANET (1929, table I), and MAILLIEUX (1933, p. 91) encompasses the whole Upper Tournaisian (Tn3), and so does the *S. konincki* (= *S. cinctus*) Zone of e.g. MORTELMANS & BOURGUIGNON (1954, table, p. 226, p. 247, p. 248), LOMBARD (1957, pp. 262-263), WATERLOT (1969, p. 19), WATERLOT *et al.* (1973, figs. 28,29, p. 53, fig. 55, p. 109), DELATTRE *et al.* (1973, p. 95).

This explains that, if it is justified to speak of a *Mesochorispira konincki* Zone, this zone is not a substitute for the old *Spirifer Konincki* Zone corresponding to the Assise de Celles.

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Explanation of Plates

All figures are natural size unless otherwise stated.

PLATE 1

- Figs. 1-7 — *Mesochorospira konincki* (DEWALQUE, 1895)
Hypotype (Autohyle), I.R.Sc.N.B. a4289 (old number: AV6294). 1-4: ventral, dorsal, apical and frontal views; 5: micro-ornament enlarged = pl. XV, fig. 6 in de KONINCK, 1883b as *Spirifer cinctus*, A. de Keyserling; 6: ventral view = pl. XV, fig. 4 in de KONINCK, 1883b as *S. cinctus*, A. de Keyserling; 7: dorsal view = pl. XV, fig. 3 in de KONINCK, 1883b as *S. cinctus*, A. de Keyserling [see lateral view figured in de KONINCK (1883b, pl. XV, fig. 5) on Plate 3].

PLATE 2

- Figs. 8-13 — *Mesochorospira konincki* (DEWALQUE, 1895)
Hypotype (Autohyle), I.R.Sc.N.B. a4290 (old number: AV6044). 8-11: ventral, lateral, apical and frontal views; 12: ventral view = pl. XXVI, fig. 2 in de KONINCK, 1887 as *Spirifer cinctus*, A. de Keyserling; 13: micro-ornament enlarged = pl. XXVI, fig. 3 in de KONINCK, 1887 as *S. cinctus*, A. de Keyserling [see dorsal view figured by de KONINCK (1883b, pl. XV, fig. 7; 1887, pl. XXVI, fig. 1) on Plate 3].
- Fig. 14 — ? *Mesochorospira konincki* (DEWALQUE, 1895) [more probably *Atylephorus tornacensis* (de KONINCK, 1883b)]. - Doubtful hypotype, I.R.Sc.N.B. a4291 (old number: AV6046). Interior of pedicle valve = pl. XV, fig. 8 in de KONINCK, 1883b = pl. XXVI, fig. 4 in de KONINCK, 1887 as *Spirifer cinctus*, A. de Keyserling (see new photograph on Plate 3).

PLATE 3

- Fig. 15 — ? *Mesochorospira konincki* (DEWALQUE, 1895) [more probably *Atylephorus tornacensis* (de KONINCK, 1883b)]. - Doubtful hypotype, I.R.Sc.N.B. a4291 (old number: AV6046). Interior of pedicle valve [see same figure in de KONINCK (1883b, pl. XV, fig. 8; 1887, pl. XXVI, fig. 4) on Plate 2].
- Figs. 16, 18, 20 — *Mesochorospira konincki* (DEWALQUE, 1895)
Hypotype (Autohyle), I.R.Sc.N.B. a4290 (old number: AV6044). 16: dorsal view; 18: micro-ornament (x5); 20: dorsal view = pl. XV, fig. 7 in de KONINCK, 1883b = pl. XXVI, fig. 1 in de KONINCK, 1887 as *Spirifer cinctus*, A. de Keyserling [see ventral view and micro-ornament figured by de KONINCK (1887, pl. XXVI, figs. 2,3) on Plate 2].
- Figs. 17, 19, 21 — *Mesochorospira konincki* (DEWALQUE, 1895)
Hypotype (Autohyle), I.R.Sc.N.B. a4289 (old number: AV6294). 17: lateral view; 19: micro-ornament (x5); 21: lateral view = pl. XV, fig. 5 in de KONINCK, 1883b as *Spirifer cinctus*, A. de Keyserling [see dorsal view, ventral view, and micro-ornament figured by de KONINCK (1883b, figs. 3,4,6) on Plate 1].

PLATE 4

- Figs. 22-25 — *Mesochorospira konincki* (DEWALQUE, 1895) Hypotype (Autohyle), I.R.Sc.N.B. a5578 (old number: AV6045)
22-24: ventral, lateral and frontal view; 25: ventral view = pl. XXIV, fig. 7 in de KONINCK, 1887 as *Spirifer cinctus*, A. de Keyserling [see dorsal view figured by de KONINCK (1887, pl. XXIV, fig. 6) on Plate 5].
- Figs. 26-30 — *Palaeochoristites cinctus* (KEYSERLING, 1846).
Cast (3/4 the original size) of specimen A.S.N°200/1393, from the Chernyshino limestones of the Moscow Basin, figured by SOKOLSKAYA (1941, pl. III, figs. 1a-e), and by SARYCHEVA & SOKOLSKAYA (1952, pl. 55, fig. 321). Ventral, dorsal, lateral, apical and frontal views.

PLATE 5

- Figs. 31-33 — *Mesochorospira konincki* (DEWALQUE, 1895)
Hypotype (Autohyle), I.R.Sc.N.B. a5578 (old number: AV6045). 31,32: dorsal and apical views; 33: dorsal view = pl. XXIV, fig. 6 in de KONINCK, 1887 as *Spirifer cinctus*, A. de Keyserling [see ventral view figured by de KONINCK (1887, pl. XXIV, fig. 7) on Plate 4].
- Figs. 34-38 — *Spirifer konincki sensu* DOUGLAS, 1909 (= *Palaeochoristites douglasi* BUBLICHENKO, 1976).
Cast of lectotype (Oxford University Museum E261). Ventral, dorsal, lateral, apical and frontal views.

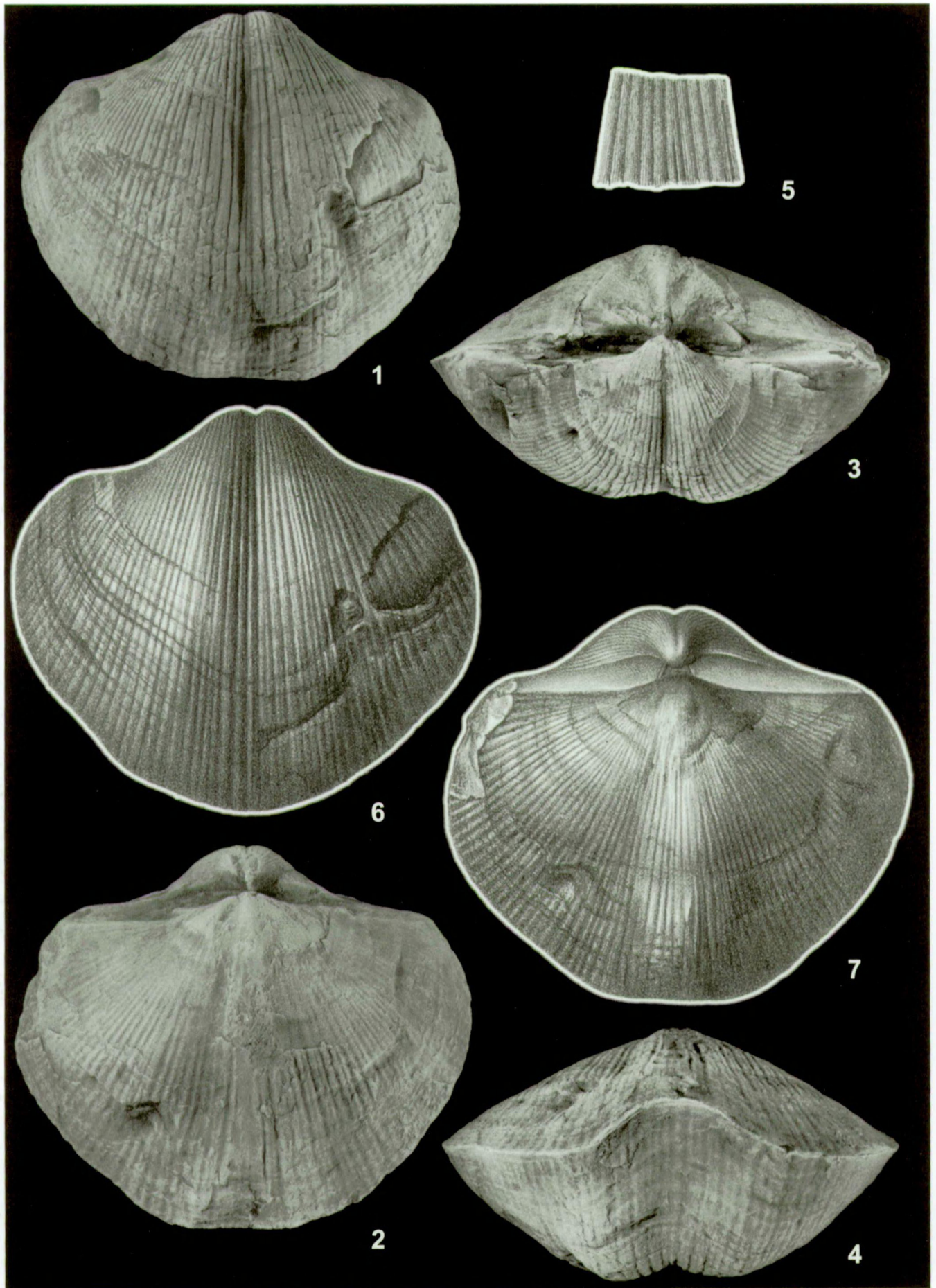


PLATE 1

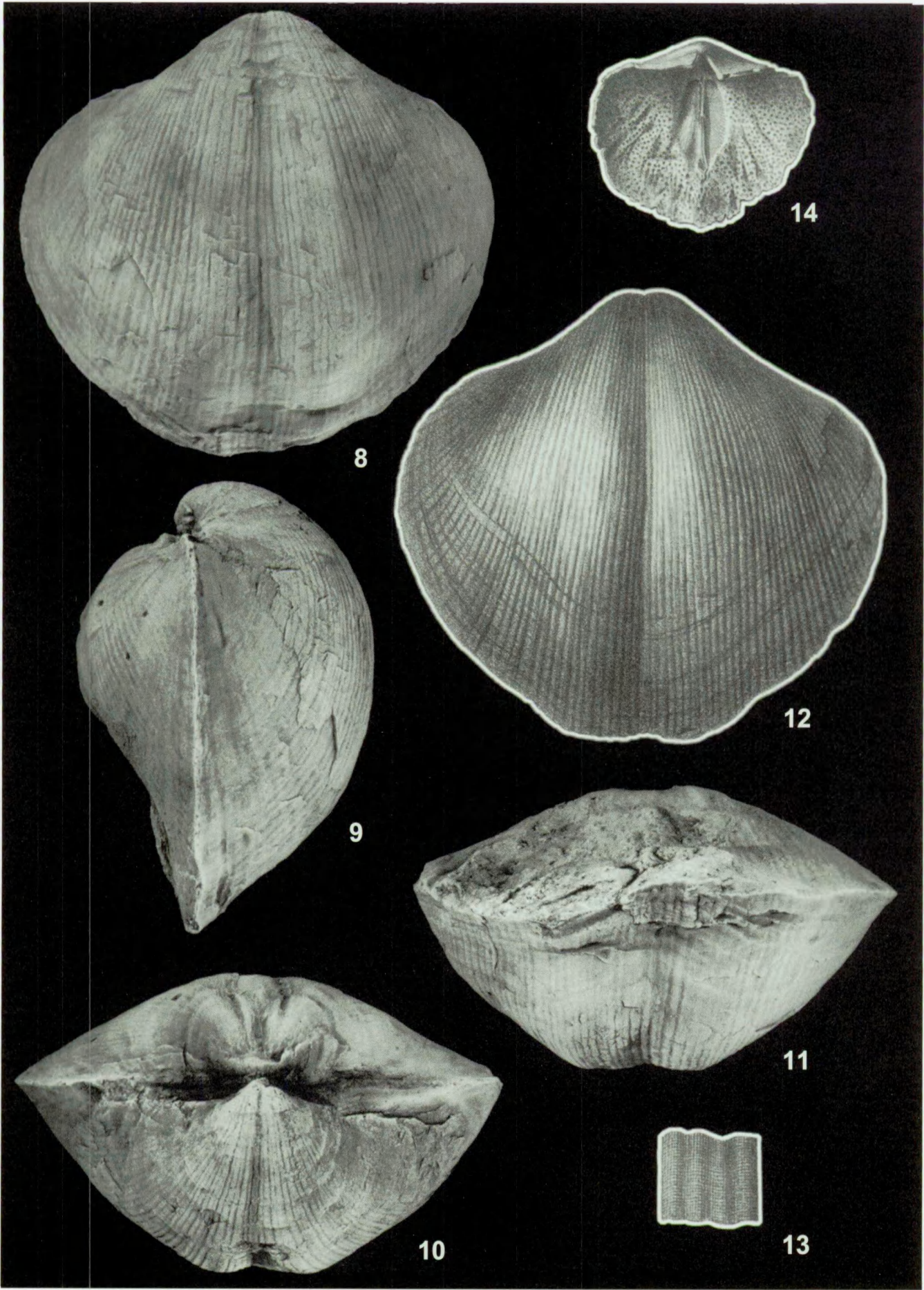
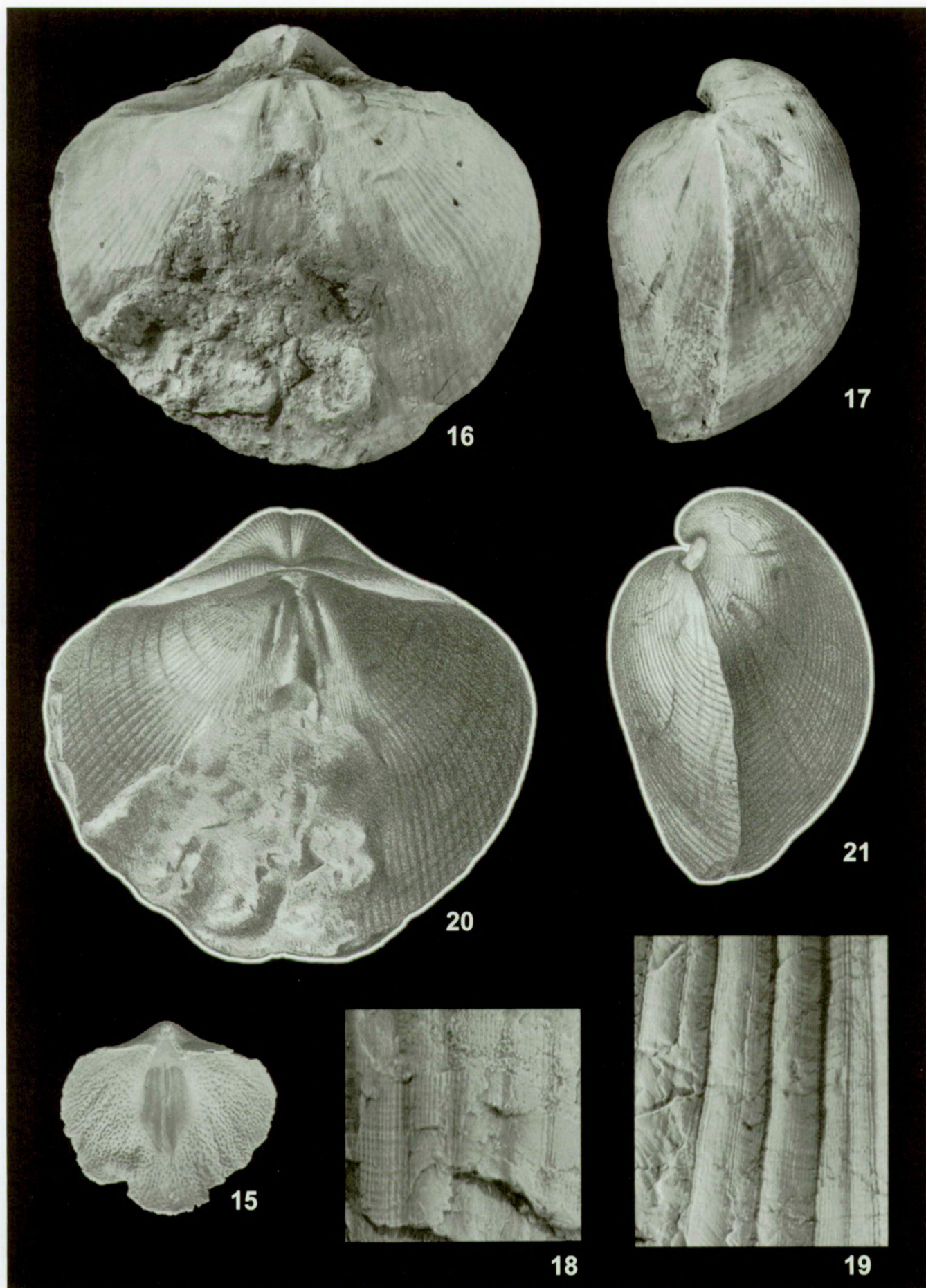


PLATE 2



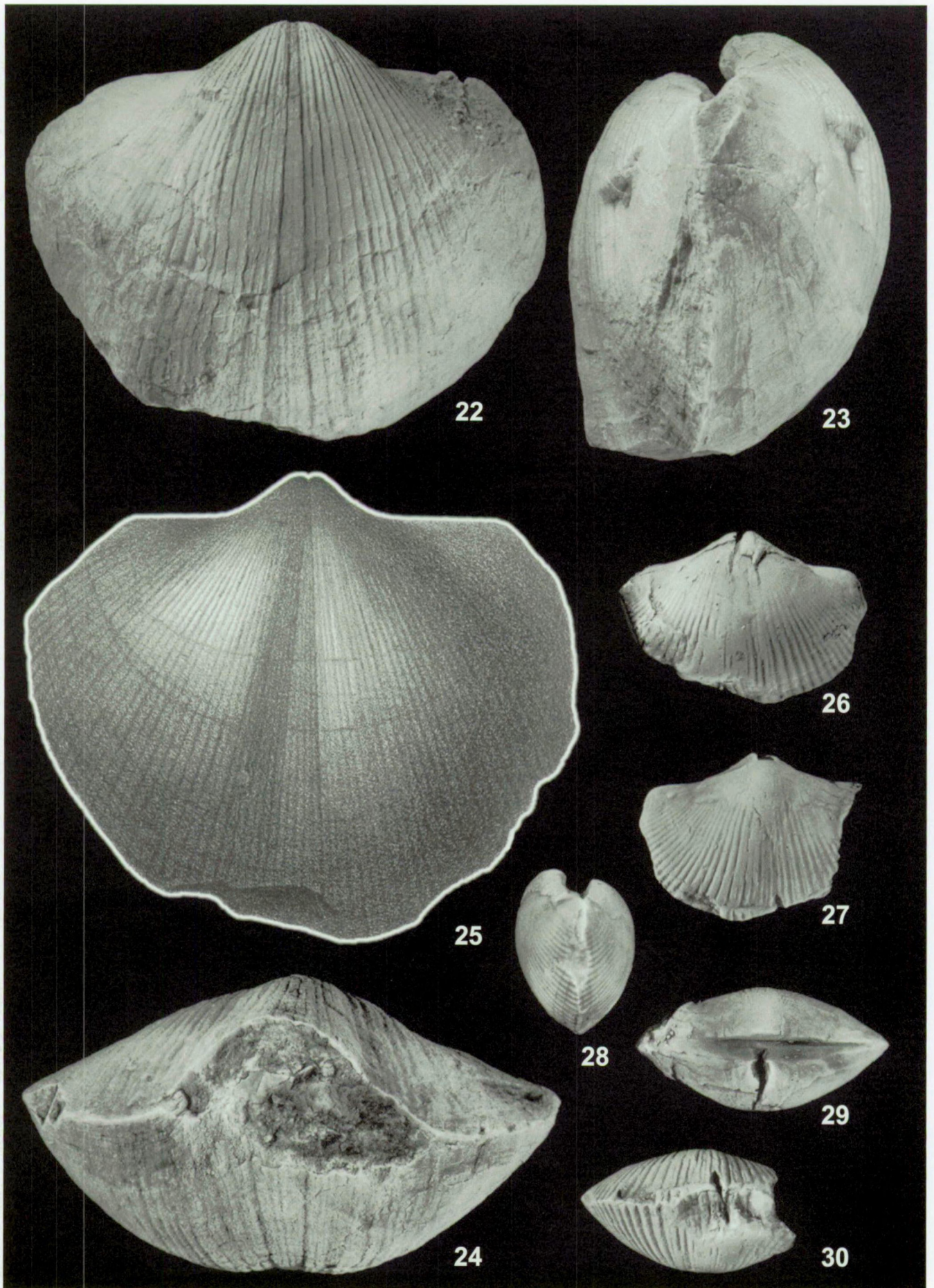


PLATE 4

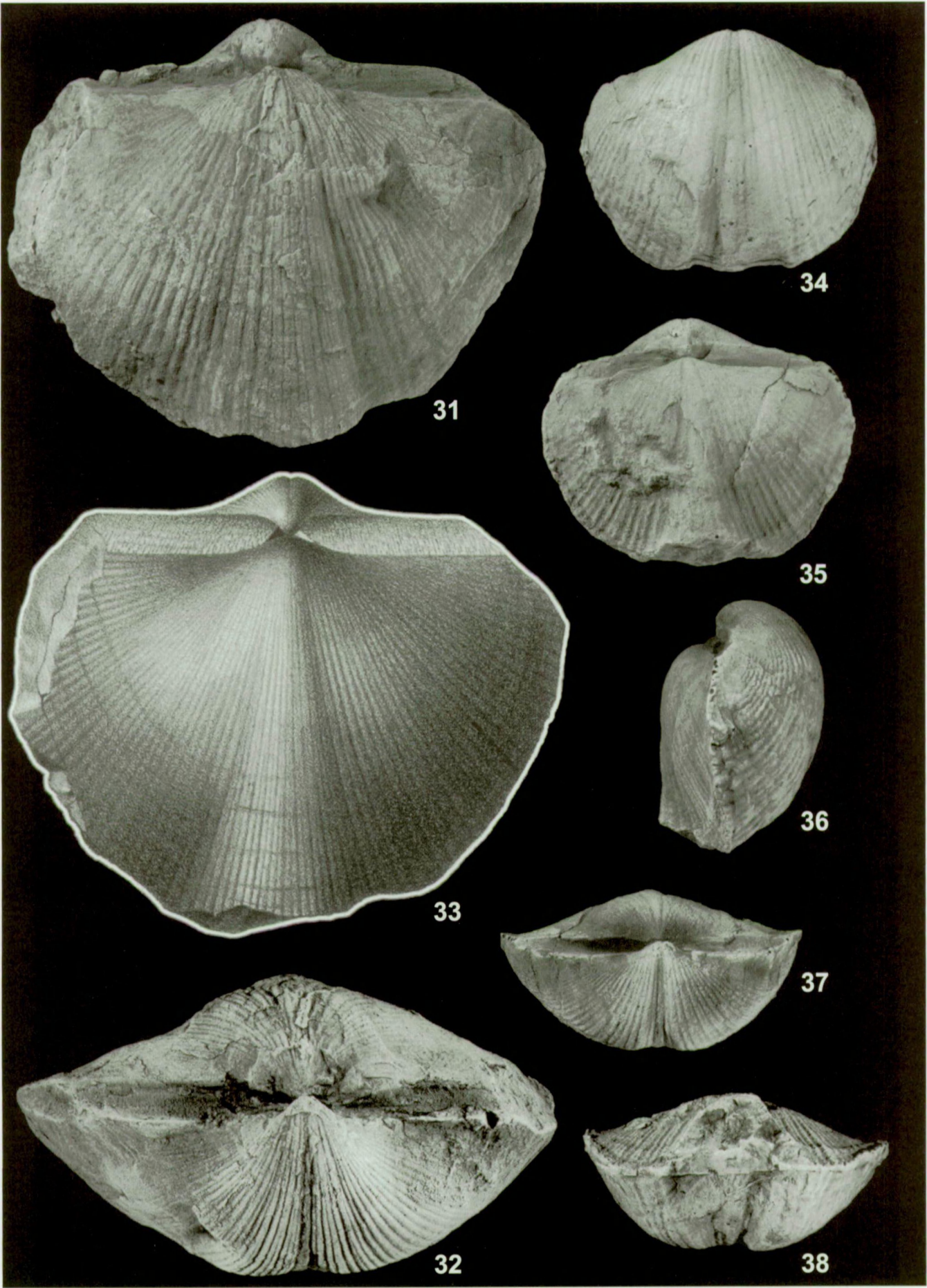


PLATE 5